[0028] According to an exemplary embodiment, the temperature T_2 corresponds to a temperature range of 850° C. to 1000° C. More preferably the temperature T_2 corresponds to 880° C. to 930° C.

[0029] According to another exemplary embodiment, the heating of the pre-alloyed substrate to which the corrosion protection oil has been applied to the temperature T_2 comprises the following process steps:

[0030] heating the substrate to the temperature range T_2 of 850° C. to 1000° C., preferably 880° C. to 930° C.,

[0031] holding the substrate in the temperature range T_2, and

[0032] cooling the substrate to a temperature range T_3 of 550° C. to 780° C., preferably 600° C. to 700° C.

[0033] The heating to T_2 is preferably 60 to 210 s, preferably 90 to 180 s. The heating of the substrate in this case is dependent on the thickness of the substrate and must be adjusted individually in relation to the respective substrate used.

[0034] It is preferred that the holding in the temperature range T_2 is 60 to 600 s, preferably 30 to 120 s.

[0035] The cooling takes place preferably with a cooling rate in the range of 5 to 25 K/s, preferably in the range 10 to 20 K/s.

[0036] Furthermore, the cooling of the substrate preferably takes place during the transfer of the substrate to a mold, where the substrate undergoes a shaping process.

[0037] A further cooling then takes place during the shaping process in order to then cure with full positive engagement with the mold.

[0038] The heating to T_2 preferably takes place under a protective atmosphere. Dry air or a protective gas, such as a nitrogen gas for example, can be used as a protective atmosphere.

[0039] In another exemplary embodiment, the temperature T_1 corresponds to a temperature range of 550° to 750° C., preferably of 550° to 700° C.

[0040] In another exemplary embodiment, the composition contains at least 98% by weight, preferably 98.5-99% by weight of the fatty acid esters. In the case of this type of composition, the gaseous combustion residues are made up of CO_2 and H_2O and can be discharged from the furnace chamber along with the exhaust air without further expensive measures.

[0041] In yet another exemplary embodiment, the fatty acid esters is a C_8-C_{16} compound, more preferably a C_{11}-C_{17} compound.

[0042] The composition preferably has a sulfur content in the range of 1-2% by weight, more preferably in the range of 1-1.5% by weight.

[0043] The composition preferably has a saponification number in the range of 150-265 mg KOH/g, more preferably in the range of 165-195 mg KOH/g.

[0044] In still another exemplary embodiment, the corrosion protection oil is applied to the substrate in a quantity 0.5 to 2 g/m^2, more preferably 0.7-1.7 g/m^2.

[0045] The composition of the corrosion protection oil preferably does not contain any fats.

[0046] The composition especially preferably does not contain any additives or inhibitors.

[0047] According to a further exemplary embodiment, the corrosion protection oil is not removed from the substrate to which the corrosion protection oil has been applied by means of a cleaning step before it is heated to the temperature T_2. As a result, it is possible to dispense with, among other things, a complex cleaning device within the process. Furthermore, the entire process becomes not only more cost effective, because the process times are shorter as compared to methods with a cleaning step, but also more environmentally friendly.

[0048] According to a further aspect, the present disclosure relates to the use of a corrosion protection oil consisting of a composition containing fatty acid esters as temporary corrosion protection for the storage and/or transport of pre-alloyed substrates consisting of a steel product coated with an Al—Si protective coating.

EXAMPLES

[0049] The present disclosure will be explained in greater detail in the following based on examples.

[0050] A substrate consisting of a steel sheet with a sheet thickness of 1.5 mm with quality 22MnB5 was provided with a 25 μm thick Al—Si protective coating in a hot-dip process. The protective coating contained 10% by weight Si, 3% by weight Fe and the remainder Al. The steel product coated with the Al—Si protective coating was pre-alloyed as a pre-assembled plate at 700° C. in a circulating air furnace. The Al—Si protective coating of the steel sheet that was pre-alloyed in this manner now contained 30% by weight Fe, 10% by weight Si and the remainder Al. Then 0.5 g/m^2 of a corrosion protection oil was applied in a roller application process. The corrosion protection oil used in this case was a fatty acid derivative of a native oil, which does not contain any further additives or inhibitors. After transport and storage, these sheets were further processed at a site that is not protected from the weather. Prior to further processing, no changes to the surface or corrosion damage could be detected. The sheets were conveyed by means of industrial robots to a hot forming furnace for further processing and austenitized at 925° C. in 2.5 min enough that they could then be shaped and cured in a cooled mold. Measurements at the hot forming furnace showed no further emissions in the furnace atmosphere other than CO_2, H_2O and the furnace atmosphere that already existed beforehand in the form of nitrogen. No residues of the applied oil could be detected even on the press hardened component.

[0051] It will be appreciated that various of the above-disclosed and other features and functions, or alternatives or varieties thereof, may be desirably combined into many other different systems or applications. Also that various presently unforeseen or unanticipated alternatives, modifications, variations or improvements therein may be subsequently made by those skilled in the art which are also intended to be encompassed by the following claims.

1. Method for producing a component made of a steel product coated with an Al—Si protective coating, comprising:

providing a substrate consisting of a steel product coated with an Al—Si protective coating,

heating the substrate to a temperature T**1** such that the Al—Si protective coating is only partially pre-alloyed with Fe of the steel product,

cooling the pre-alloyed substrate to room temperature,

applying a corrosion protection oil to the surface of the pre-alloyed substrate, wherein the corrosion protection oil consists of a composition containing fatty acid esters,